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(54) A wheel

(57) A wheel for a vehicle, especially a toy vehicle, comprises a shaft (2), a mounting member (17) fixed to the shaft (2), a hollow wheel body (1) rotatably mounted on the shaft (2), a flywheel (12) rotatably mounted on the shaft (2) within the hollow wheel body (1) and an accelerating gear chain (14) for transmitting rotation of the hollow wheel body (1), relative to the shaft (2), to the flywheel (12) and vice versa.

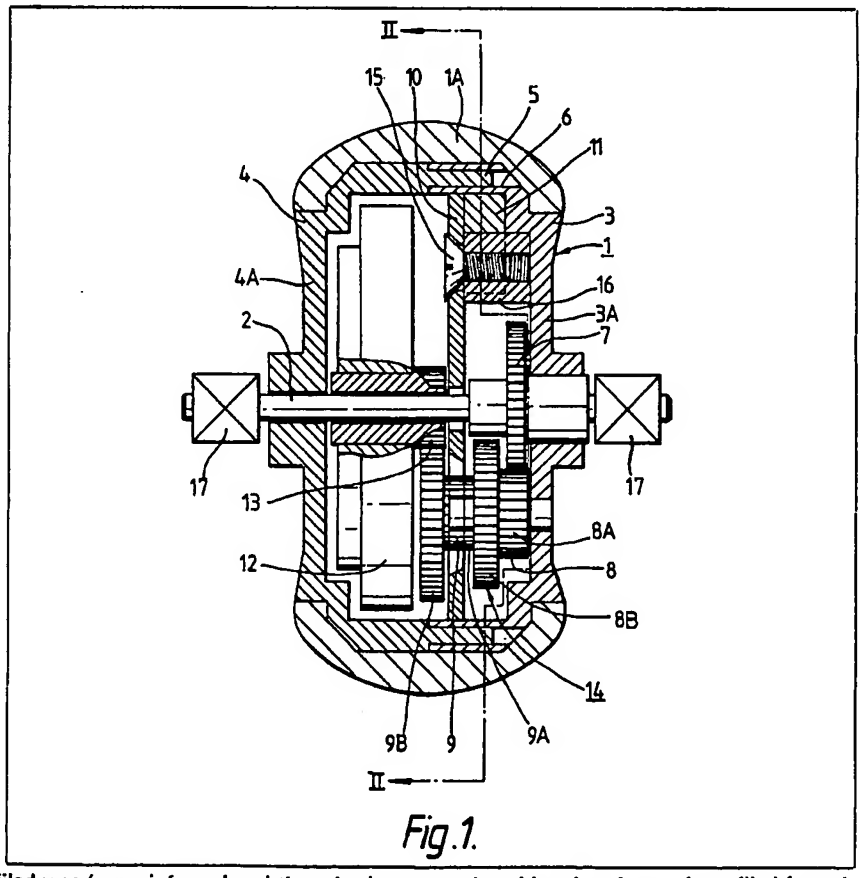

Fig.1.

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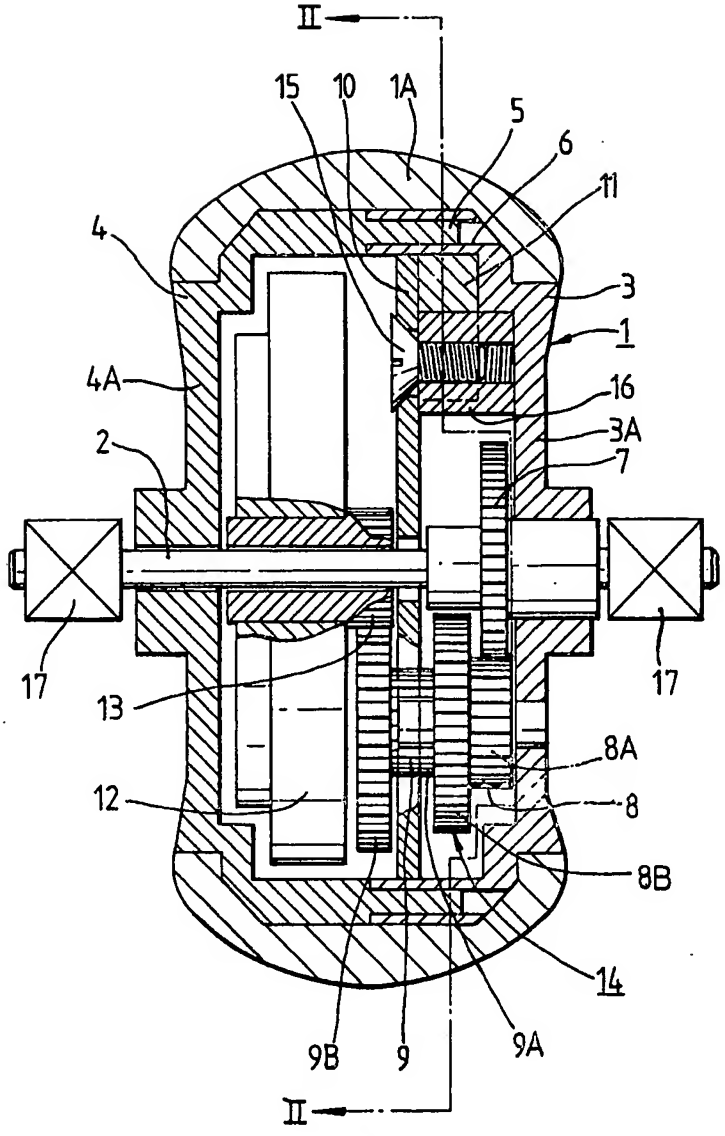

Fig.1.

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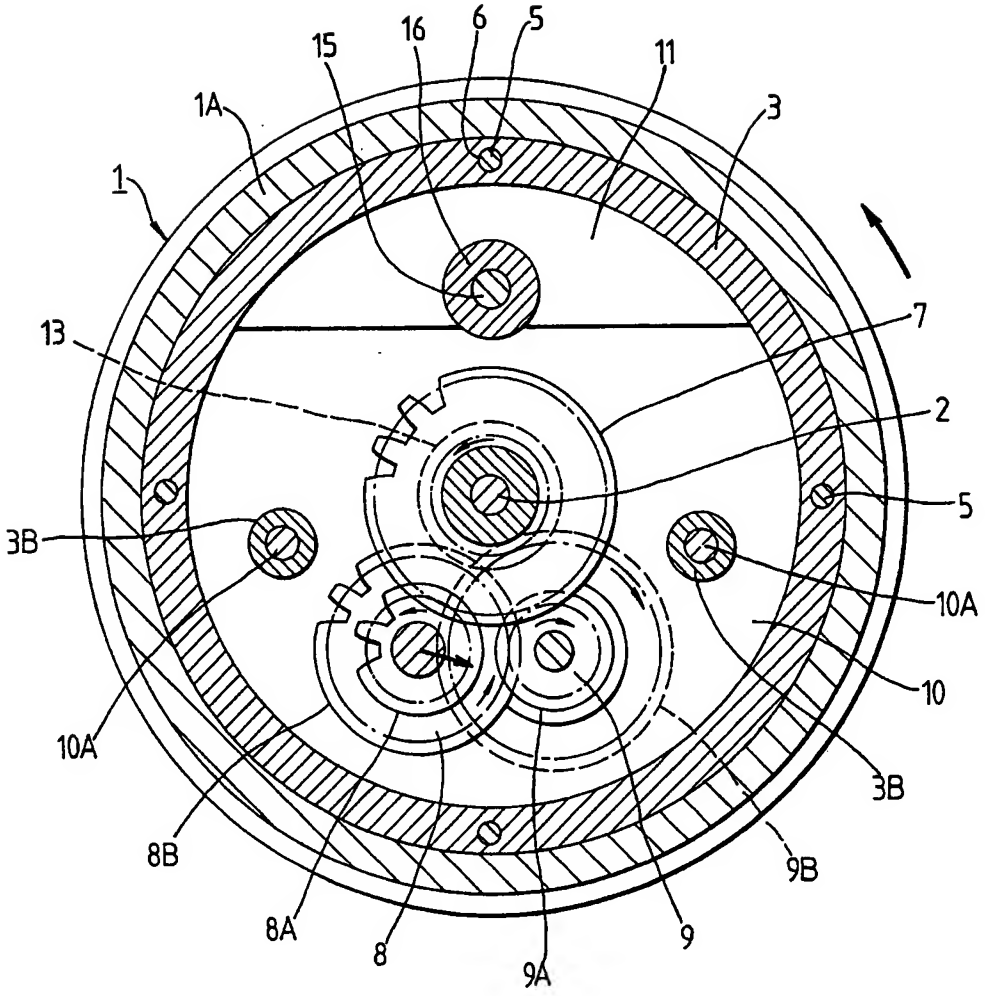

Fig.2.

SPECIFICATION

A wheel

This invention relates to a wheel.

According to a first aspect of the invention there is provided a wheel, which wheel comprises a rotatable wheel body and further means forming part of the wheel for storing energy imparted to the wheel by rotating the wheel body.

According to a preferred aspect of the invention there is provided a wheel for a toy vehicle, comprising a shaft which is fixed to a mounting member and a hollow wheel body rotatably mounted on the shaft, wherein the wheel body contains a flywheel which is rotatably mounted on the shaft and an accelerating gear chain for coupling the wheel body with the flywheel.

Preferably, the mounting member comprises a portion of non-circular cross-section.

The invention further provides a vehicle whenever having a wheel in accordance with the first aspect, and, advantageously, a vehicle having two such wheels, the arrangement being such that, when the wheel bodies of the two wheels are rotated at the same peripheral speed, the energy storing means of one wheel stores more energy than the energy storing means of the other wheel.

For a better understanding of the present invention, and to show how the same may be put into effect, reference will now be made, by way of example, to the accompanying drawing, in which:

Figure 1 is an enlarged sectional view, partially cut away, of a wheel in accordance with the present invention, and

Figure 2 is a sectional view taken on the line II–II of Fig. 1.

Referring now to the drawings, the wheel comprises a wheel body 1 which is hollow and through which a shaft 2 rotatably extends along the axis of rotation of the wheel body 1. The wheel body 1 is substantially disc shaped and comprises two coaxial substantially disc shaped members 3 and 4 which define side walls 3A and 4A, respectively, of the wheel. One of the disc shaped members 3 is provided around the periphery thereof with a circular, axially extending, groove 6 and the other disc shaped member 4 is provided around the periphery thereof with a circular, axially extending, rim 5 for engaging in the groove 6 so as to facilitate assembly and disassembly of the wheel body 1 and to lock firmly together the two disc shaped members 3 and 4 in the assembled wheel. Alternatively, one of the disc shaped members 3 may be provided at or near the periphery thereof with a plurality of axially extending pegs or projections 5, and the other of the disc shaped members 4 may be provided at or near the periphery thereof with a plurality of axially extending holes 6 in which the projections 5 engage. An annular tyre 1A, which comprises a synthetic resin, rubber or the like, is mounted around the rim of the assembled wheel body and may if desired be fixed thereto, for example adhered.

A sun gear 7 is coaxially fixedly mounted on the shaft 2 for rotation therewith adjacent the inner surface of one of the side walls 3A of the wheel body 1. A planetary gear 8 is journalled to the said side wall 3A and cooperates with the sun gear 7. The planetary gear 8 and the sun gear 7 thus form together an epicyclic gear system in which rotation of the wheel body 1 causes the planetary gear 8 not only to travel round the sun gear 7 but also to rotate about its own axis. The planetary gear 8 consists of a driving wheel 8A and a driven wheel 8B which are integrally formed, the driven wheel 8B having a larger number of teeth than the driving wheel 8A, and the sun gear 7 meshes with the driving wheel 8A. An intermediate gear 8 is journalled to the inner surface of the same side wall 3A and comprises a driving wheel 9A and a driven wheel 9B, having a larger number of teeth than the driving wheel 9A, which are integrally formed. The driving wheel 9A of the intermediate gear 9 meshes with the driven wheel 8B of the planetary gear 8.

A partition 10 is provided in the wheel body 1 for supporting the planetary gear 8 and the intermediate gear 9, and a balancing weight 11 is disposed between the partition 10 and the side wall 3A to which the said gears are journalled. As can be seen from Fig. 2, the balancing weight 11 is arranged to balance the weights of the planetary gear 8 and the intermediate gear 9 and is disposed in substantial radial alignment with a point lying midway between the planetary gear 8 and the intermediate gear 9. This balances the wheel and ensures that the same will rotate relatively smoothly.

The partition 10 also defines a chamber within the wheel body 1 on the other side of the partition 10 from the sun gear 7, the planetary gear 8 and the intermediate gear 9 and a flywheel 12 is rotatably mounted on the shaft 2 within the chamber. The flywheel 12 is fixed to or integrally formed with a flywheel driving gear 13 which is coaxial with the flywheel 12. The driving gear 13 meshes with the driven wheel 9B of the intermediate gear 9, which extends through an aperture of the partition 10.

Thus, the wheel body 1 contains an accelerating gear chain 14 comprising the sun gear 7, the planetary gear 8, the intermediate gear 9 and the flywheel driving gear 13. The accelerating gear chain 14 couples the wheel body 1 with the flywheel 12 so that the flywheel 12 can be set in motion by rotation of the wheel body 1.

In the embodiment illustrated, the gear

numbers of the sun gear 7, the driving wheel 8A of the planetary gear 8, the driven wheel 8B of the planetary gear 8, the driving wheel 9A of the intermediate gear 9, the driven wheel 9B of the intermediate gear 9 and the flywheel driving gear 13 are 17, 8, 18, 7, 20 and 8 respectively. The acceleration ratio of the gear chain 14 is thus approximately 14.

A screw 15 is provided for securing the partition 10 firmly to the side wall 3A, and the screw 15 is screwed into a threaded hole provided in a projection 16 fixed to or integrally formed with the side wall 3A. In addition, the partition 10 is fixed to or integrally formed with projections 10A which engage in respective holes 3B in the side wall 3A.

In an alternative embodiment, the accelerating gear chain 14 may comprise an internal gear, fixed to an inner surface of the wheel body 1 and coaxial with the wheel body 1 for rotation therewith, and a planetary gear meshing with the internal gear, the axis of rotation of the planetary gear being fixed with respect to the shaft 2. For example, the planetary gear may be journalled to an arm secured to the shaft. The planetary gear may coact with the driving gear 13 of the flywheel 12 *via* a number of intermediate gears which ensure that the wheel body 1 and the flywheel 12 turn in the same direction. The intermediate gears may, for example, be journalled to a partition which is fixed with respect to the shaft 2. By selecting an accelerating gear chain 14 comprising an internal gear fixed to an inner surface of the wheel body 1 there can be obtained a simple construction and a relatively high acceleration ratio.

Square washers 17 are fixed adjacent each end of the shaft 2. In use, one or both of the square washers 17 is/are inserted into square hole(s) provided in the body of a toy vehicle or the like with which the wheel is to be used. Instead of providing the square washers 17, each end of the shaft 2 may be square in section. The wheel body 1 is then set in rotation, for example using the hand or by moving the toy vehicle or the like manually along a surface. This causes the flywheel 12 to rotate and to accumulate kinetic energy. When the application of the external turning force ceases, the wheel continues to move because of the kinetic energy which has accumulated in the wheel body 1 and the flywheel 12. Even if the wheel body 1 is rotating relatively slowly, the amount of kinetic energy stored is large because of the rapid rotation of the flywheel 12 and the vehicle or the like can thus carry on moving for longer.

The wheel of the present invention may be used, for example, with toy motor cycles, toy three wheeled vehicles or toy motor cars. All of the wheels of the toy vehicle may be of the type described above, or only the front or rear wheels. Flywheels 12 of various weights may be used. For example, the left and right rear wheels of a toy vehicle may have respective flywheels 12 of different weights to produce a turning motion of predetermined radius of curvature.

Thus, the present invention enables the provision of a toy vehicle or the like having a flywheel mechanism simply by attaching the wheel of the invention to the toy vehicle or the like. There is no necessity to provide a flywheel mechanism in the toy itself and there is thus a considerable space saving as a result of which the design of the toy can be more varied and is less restricted by functional considerations.

Furthermore, the invention enables the provision of a wheel which is simple in construction, and thus relatively easy to manufacture, but which provides a large acceleration ratio for a flywheel mechanism. For example, this is effected by the provision of the accelerating gear chain 14 having the sun gear 7 fixed to the shaft 2, the planetary gear 8 journalled to the side wall 3A of the wheel body 1, the intermediate gear 9 journalled to the side wall 3A of the wheel body 1, each of the planetary gear 8 and the intermediate geaer 9 having a driving wheel 8A, 9A and a driven wheel 8B, 9B integrally formed therewith, and the flywheel driving gear 13 coaxially fixed to the flywheel 12.

CLAIMS

1. A wheel, which wheel comprises a rotatable wheel body and further means forming part of the wheel for storing energy imparted to the wheel by rotating the wheel body.

2. A wheel according to Claim 1, wherein the said further means comprises a flywheel and gear means for transmitting rotation of the wheel body to the flywheel and vice versa.

3. A wheel according to Claim 2, wherein the gear means comprises reduction gearing between the flywheel and the wheel body.

4. A wheel according to Claim 2 or 3, wherein the wheel body and the flywheel are rotatably mounted on a common shaft and the flywheel and the gear means are disposed within the wheel body.

5. A wheel according to Claim 4, wherein the gear means comprises a sun gear fixed to the shaft, a planetary gear rotatably mounted to an inner surface of the wheel body, a first portion of the planetary gear meshing with the sun gear, an intermediate gear rotatably mounted to an inner surface of the wheel body, a first portion of the intermediate gear meshing with a second portion of the planetary gear, and a driving gear rotatably mounted on the shaft and fixed to or integrally formed with the flywheel, the driving gear meshing with a second portion of the intermediate gear.

6. A wheel according to any one of the preceding claims, further comprising means for detachably mounting the wheel to a

vehicle body.

7. A wheel according to Claims 4 and 6, wherein the mounting means comprises a portion of non-circular cross-section which is fixed to or integrally formed with an end of the shaft.

8. A wheel according to any one of the preceding claims, which is a wheel for a toy vehicle.

9. A wheel for a wheeled vehicle, substantially as hereinbefore described with reference to the accompanying drawings.

10. A vehicle having a wheel in accordance with any one of the preceding claims.

11. A vehicle having two wheels in accordance with any one of Claims 1 to 9, the arrangement being such that, when the wheel bodies of the two wheels are rotated at the same peripheral speed, the energy storing means of one wheel stores more energy than the energy storing means of the other wheel.

12. A vehicle having two wheels in accordance with Claim 2, wherein the flywheel of one wheel is heavier than the flywheel of the other wheel.

13. Any novel feature or combination of features described herein.

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